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RESEARCH AND DEVELOPMENT
PROJECT APPROVAL REQUEST

I. Identification

A feasibility study of a Modulated-Light, Film Viewing System is proposed under the Technical Development Program of the P&DS, NPIC. The total study program will comprise three feasibility studies performed by separate firms at respective estimated costs of [REDACTED]. The item was originally included in the NPIC financial plan for Fiscal Year 1964 at the [REDACTED] level under the category "Special Techniques and Development Studies." The additional funds are available within the approved budget.

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II. Objectives

The purpose of the program is to conduct feasibility studies of all light modulation concepts that have a potential for improving the state-of-the-art in both 1:1 viewing and enlarged viewing of photographic transparencies for exploitation purposes.

The objective is to ultimately evolve an improved film viewing system that would not only reduce the physiological strain on the human visual system but also improve the display of photographic information for more effective exploitation.

III. Background

The purpose of the Modulated-Light Viewing System is related to that of automatic dodging systems as they are used in the reproduction process.

The oldest of automatic dodging systems is probably the unsharp mask as it is used in printing to attenuate tone ranges and sharpen edge gradients; however, such techniques are limited to isolated applications since they are not wholly automatic -- requiring considerable measurement, analysis and manipulation on the part of the photographer.

Truly automatic dodging first became feasible for production applications by virtue of the development of a cathode ray tube illumination system, incrementally controlled by negative feedback generated by the light transmitted through the original negative. This system is marketed under the trade name [REDACTED]. Since this development about ten years ago, automatic dodging has become an accepted standard in the reproduction of mapping photography for contact prints, plates for stereo plotters and photo mosaics -- the most dramatic effects being the attenuation of highlights in areas of specular reflection of sunlight.

Automatic dodging or "incremental exposure control" was eventually accepted by the photo interpreter, but not without reservations. Invariably, he was not

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convinced that all of the information on the original negative was faithfully reproduced by this system, and it is now conceded that this is true -- so the beneficial effects of automatic dodging in the duplication process have been lost to the more important requirement for high fidelity. But even if the automatic dodging system could be significantly improved as far as resolution is concerned, it is doubtful that it would be acceptable for the first duplication phase, since photo interpreters have different preferences for the degree or even the presence of such dodging. Yet the impact of this technology must not be underrated. It has been adopted and nurtured by the television industry to produce manifold image "enhancement" effects; still these have not satisfied the P.I. for again some of the information on the original is lost.

It is through the ingenuity of [REDACTED] of the Development Branch, Plans and Development Staff, NPIC that the most likely solution to this dilemma has been devised -- that is the Modulated Light Viewing System. By this system conventionally-produced, high-fidelity, duplicate positives may be viewed as automatically dodged positives, directly on light tables or through conventional optics and under the complete control of the P.I. himself. At his choice, he may selectively attenuate the illumination of large bright areas of specular reflection, snow or clouds; or increase illumination in the shadows; or sharpen up the edges; and then return to unmodulated illumination if he so desires. Thus, this system will not produce the degrading effects of television processes or have the inflexibility of the dodged duplicate; moreover, most of the potential of these systems for optimizing viewing conditions will be at the P.I.'s finger tips, and at his discretion.

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IV. Technical Specifications

Contractors were invited to propose development programs in two phases: "feasibility study" and "development of the prototype." Systems employing cathode ray tubes, modulated-light scanning, UV-IR phosphor-quenching, photo-chromic and phototropic masks and various combinations of these were invited. Only the proposals for CRT systems were felt to hold sufficient promise to justify development support. Contractors were advised that before the prototype phase will be pursued, the feasibility study phase must culminate which proves the operational potential of the system.

The most important performance parameters to be accomplished in the feasibility study phase are:

1. Illumination of a 9" x 9" viewing area with a source capable of incremental modulation and a maximum brightness equivalent to (at least) 1000 foot lamberts over the entire area.
2. Automatic modulation of illumination as a function of the density ($d=.05-3.0$) and spatial frequency (1 to 100 l/m) of the transparency being viewed. The operator must be able to control both the sensitivity and degree of modulation with respect to either of these variables.

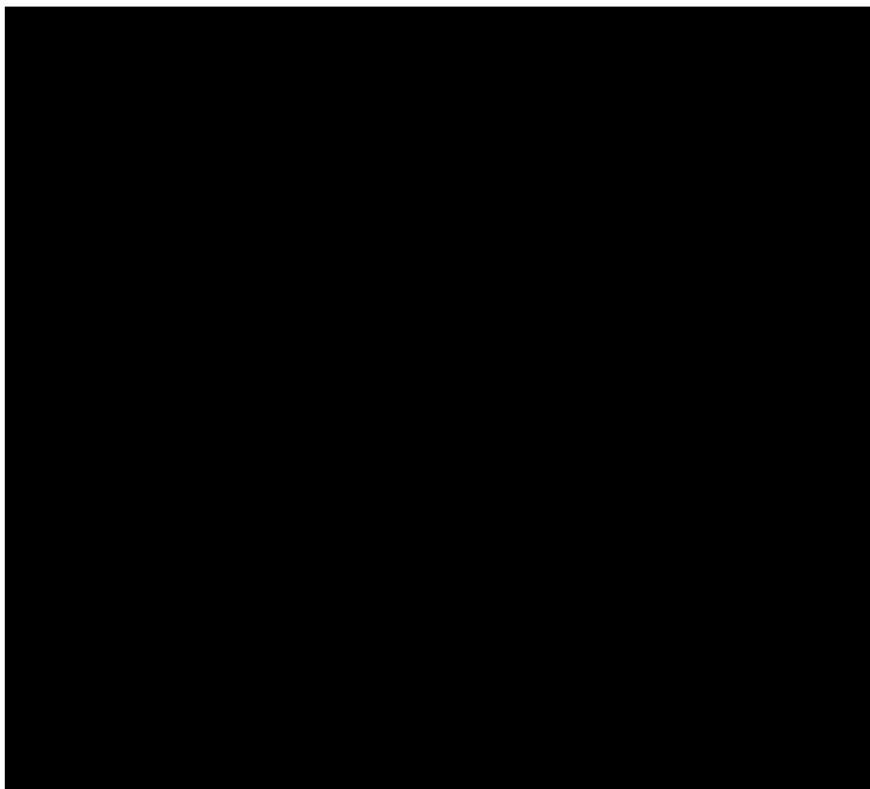
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3. A feedback system which controls the modulation and must not present any form of physical interference to the viewer.
4. Applicability to contact, 1:1, and magnified, 5X-60X viewing must be demonstrated.
5. Potential applicability to rear-projection viewing (is desired).

V. Contractor and Financial Arrangements

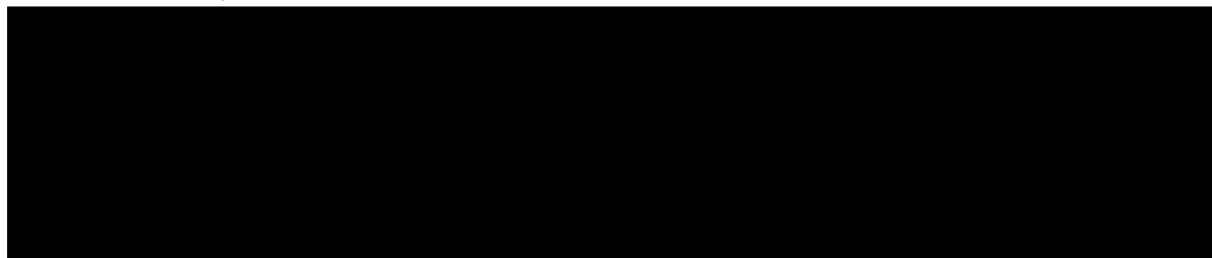
Proposals were solicited from a total of twenty-three (23) commercial concerns best qualified in the technology of active and passive light-modulating systems. The companies solicited were:

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The request for proposals covered development objectives for a "Modulated-Light Film Viewing System" dated 23 March 1964. Seven of the invited bidders responded, as follows:



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It was hoped that a broad solicitation from industry would uncover competitive but basically different approaches to the problem: that is, approaches employing "Active" systems such as electronic scanning (TV) or optical scanning; and "Passive" systems such as photochromic masking, phototropic masking or UV-IR quenching.

A review of the proposals, however, shows predominant technical favoring of the TV flying-spot scanner as the concept most likely to fulfill the requirements for a highly versatile source of illumination for viewing aerial transparencies. Only those bidders with nationally recognized capabilities in electronics, TV developments and scanning techniques were considered. These companies are the [REDACTED] It is considered that these three companies are approximately equal in capability and are all outstanding in the field of electronic scanning and modulation. Each can be expected to make significant contributions to the technology necessary for development of the prototype light-modulated film viewer.

It is therefore recommended that separate study contracts be awarded to each of the above three concerns in accordance with their respective proposals and at the prices proposed.

The Procurement Division, Office of Logistics, has been informed of this program and is expecting to undertake contract negotiation.

VI. Coordination

The proposed program has been coordinated internally with DD/S&T and externally with Air Force SPPL, Army GIMRADA and industry. In addition, investigation throughout DOD components and industry show that this program does not duplicate any other study efforts capable of meeting NPIC's requirements.

VII. Security

The program is to be negotiated on an [REDACTED] Confidential basis.

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